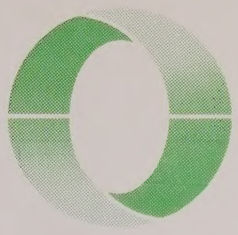

Macbeth
Division of
Kollmorgen Corporation

Transmission Densitometer TD-502, TD-502LB

Operator's Manual

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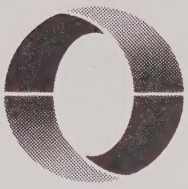

Macbeth®
Division of
Kollmorgen Corporation

OPERATOR'S MANUAL
FOR
TD-502, TD-502LB
TRANSMISSION
DENSITOMETER

ISSUE DATE: SEPT., 1974

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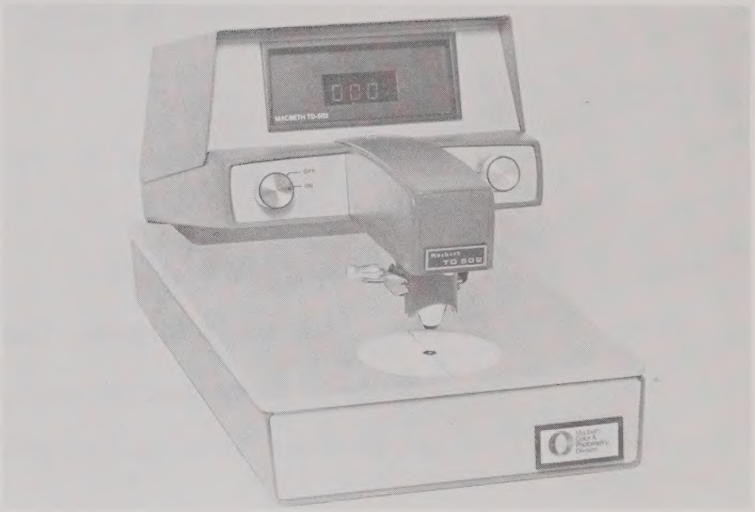


TD-502, Standard Base

TD-502LB, Large Base

FIGURE 1-1. TD-502 SERIES TRANSMISSION DENSITOMETERS

SECTION 1
OPERATING INSTRUCTIONS

1.1 GENERAL

The TD-502 series (figure 1-1) of digital-readout transmission densitometers is composed of standard and large base instruments to make black and white density measurements in the range of 0 to 4.0D.

The TD-502 may be factory-wired (at customer option) for either 115 or 230 volt operation at either 50 or 60 Hz with a total power consumption of approximately 50 watts for standard base and 120 watts for large base instruments. The power supply is self-regulating and is not affected by normal line voltage variations; therefore, an external voltage regulator is not required. Applicable operating voltage and power consumption for each instrument is indicated on a data plate located on the rear panel.

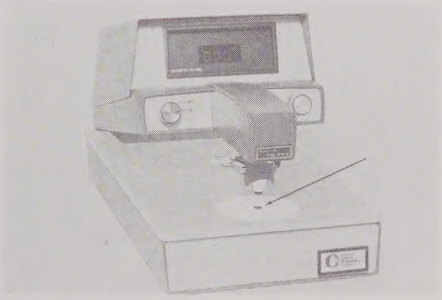
1.2 OPERATING PROCEDURE

CAUTION

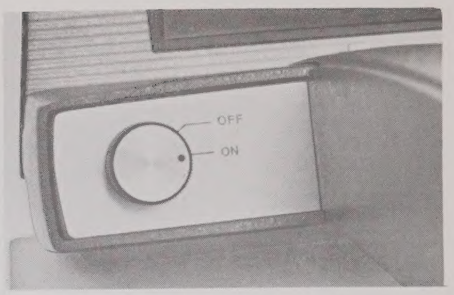
The TD-502 is convection-cooled while the TD-502LB is fan-cooled; to ensure adequate cooling, air flow around the instrument base should not be restricted during operation.

a. Ensure that the instrument is connected to the proper a-c input power source.

b. Make certain that the reading area insert is of the proper size for the sample being measured (refer to paragraph 1.3).



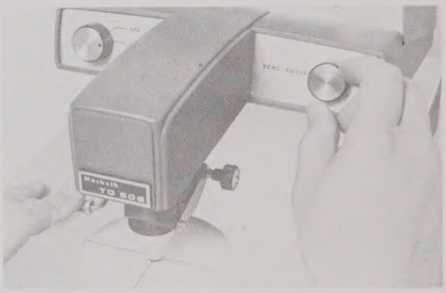
c. Set the POWER switch at ON. The instrument is ready for service immediately; no warm up time is required.



NOTE

To illuminate the stage diffuser plate of the large base instrument, set the toggle switch (located on the right rear top panel) to ON.

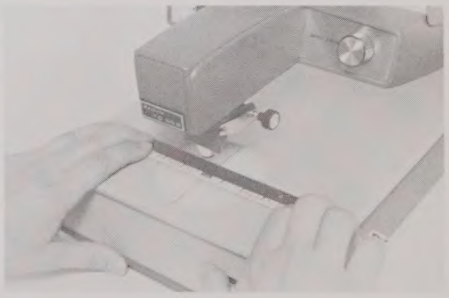
d. With no sample over the reading area insert, depress the Snout Lever and adjust the ZERO control as required for a zero indication on the digital display.



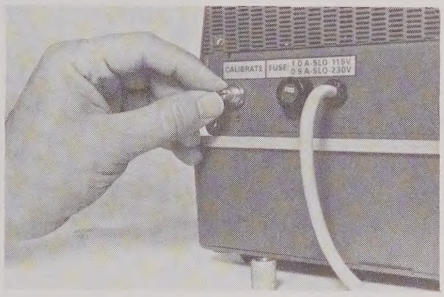
NOTE

In the event the ZERO control is adjusted for an indication below zero, the digital display will indicate 9.99, 9.98, etc., with no polarity indication.

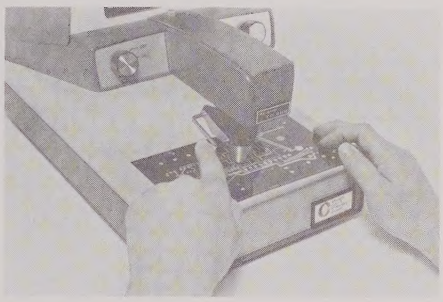
e. If a calibration check is desired: place the calibrated step tablet on the stage disc or the stage diffuser plate of the large base instruments; position the step tablet so that the "CAL" step is directly over the reading area insert. Depress the Snout Lever and observe the digital display. If required, remove the protective cap



and adjust the CAL potentiometer (located on the rear panel) until the display corresponds with the density value for the "CAL" step (as noted on the step tablet). Remove the step tablet and replace the cap on the CAL potentiometer.



f. Place the sample to be measured over the reading area insert; depress the Snout Lever and observe the digital display.

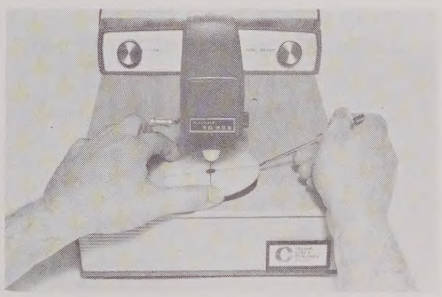


1.3 CHANGING READING AREA INSERTS

Because it is the most frequently used, the 2-mm reading area insert is installed in the TD-502 and TD-502LB prior to shipment from the factory. The TD-502 contains a circular stage diffuser disc with the insert installed. These stage discs can be replaced with ones containing 1-mm or 3-mm inserts (provided as accessory items) in order to read smaller or larger areas respectively.

1.3.1 STANDARD BASE INSTRUMENT (TD-502)

a. Using a small screwdriver, carefully lift the circular stage diffuser disc from the stage base.



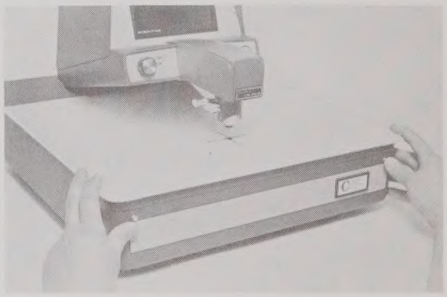
b. Replace the circular stage diffuser disc (complete with new reading area insert) in the stage base of the instrument. Note that the disc is key-fitted to its receptacle in the stage base and will seat properly in one direction only. The spring-loaded pin must be inserted into the opening at the rear of the stage diffuser disc receptacle.

c. Readjust the ZERO control prior to making measurements in conformance with paragraph 1.2(c).

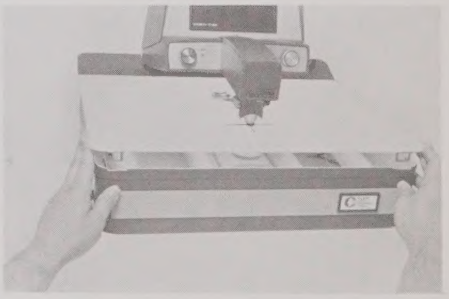
1.3.2 LARGE BASE INSTRUMENT (TD-502LB)

The entire top cover (stage diffuser plate) of the stage base must be removed to change the reading area insert. Because it is more frequently used, the 2-mm reading area insert is installed when the instrument is shipped from the factory. The insert can be replaced with 1-mm or 3-mm inserts (provided as accessory items) in order to read smaller or larger areas respectively.

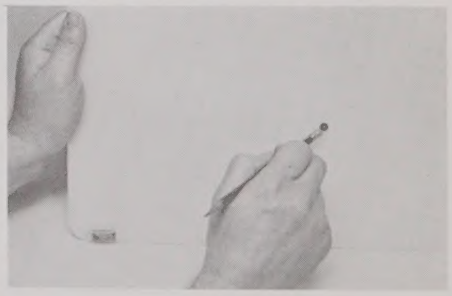
a. Depress the two release buttons located at the top left and right edges of the front panel.



b. Grasp the diffuser plate from the sides and lift up to clear the reading area insert from its engagement with the aperture cone; draw the plate towards the operator.



c. Remove the reading area insert by pushing from the bottom with a common pencil eraser.



d. Replace the insert by installing it into the opening from the top of the plate and then gently depress until seated.

NOTE

When installing the diffuser plate, caution must be exercised to prevent striking the aperture cone on top of the illumination assembly in the stage base.

e. Install the stage diffuser plate by lifting to clear the aperture cone and sliding the rear tabs under the metal edges located at the top rear of the base assembly. Lower the stage diffuser plate ensuring that the top of the aperture cone is inserted into the bottom of the reading area insert. When properly seated the two front latches will secure the diffuser plate.

CAUTION

Do not attempt to force the diffuser plate into a latched condition or damage to the equipment may result.

SECTION 2
OPERATOR'S MAINTENANCE

2.1 INSPECTION AND CLEANING

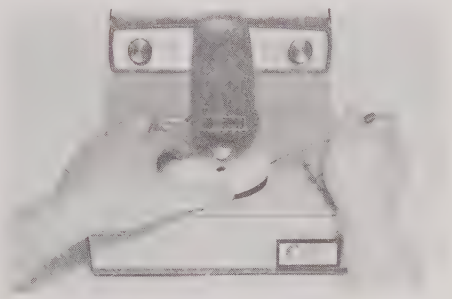
Dust, dirt, moisture and other destructive environmental elements can contribute to equipment malfunction; therefore, the optical system should be inspected and cleaned periodically. The frequency of this inspection and cleaning should, of course, be dependent upon: (1) the frequency of instrument usage; and (2) environmental conditions. A camel hair brush should be used for cleaning all optical components.

CAUTION

Ensure that a-c input power has been disconnected from the instrument before attempting inspection and cleaning procedures.

2.1.1 STANDARD BASE INSTRUMENT (TD-502)

a. Using a small screwdriver, remove the circular stage diffuser disc and inspect the reading area insert for dust and dirt accumulations.



b. Inspect the folding mirror and imaging lens for dust or dirt accumulations or possible damage such as cracks or scratches.

c. Carefully set the instrument on its side. Loosen and remove the three screws securing the circular access plate to the instrument base. Inspect the light source and reflector for possible accumulation of dust, dirt, or grease.

CAUTION

If the light source is touched with bare fingers, it must be cleaned with isopropyl alcohol before a-c power is applied to the instrument.

d. Replace the bottom access plate, set instrument upright, and replace the circular stage diffuser disc.

NOTE

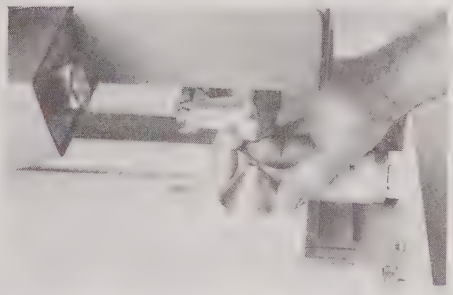
The circular stage diffuser disc is keyed to fit its receptacle in one direction only. The spring-loaded pin must be inserted into the opening at the rear of the receptacle in the stage base.

2.1.2 LARGE BASE INSTRUMENT (TD-502LB)

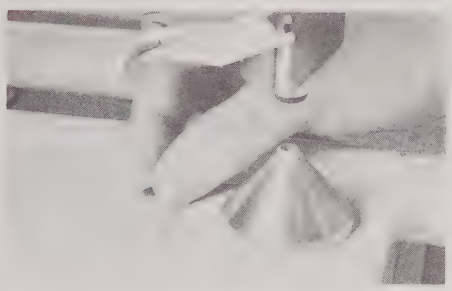
a. Depress the two latch release buttons located at the top left and right edges of the front panel.

b. Grasp the stage diffuser plate and lift up to clear the reading area insert from its engagement with the aperture cone; draw the plate towards the operator to remove.

c. Remove the aperture cone by grasping the knurled edge and turning until the tension lock is relieved. Inspect the aperture cone, folding mirror, and imaging lens for dust and dirt.



d. Remove the illumination assembly cover by unscrewing the captive screw and lifting the cover upwards and foward. Inspect the lamp for dust and dirt.



e. Inspect the four fluorescent lamps for dust, dirt, and any accumulation of foreign matter.

f. Replace the illumination assembly cover by sliding the rear edge of the cover into the slot, lowering the cover, and securing with the captive screw.

g. Replace the aperture cone by inserting the locking tabs into the opening provided and turning the cone until secure.

h. Replace the stage diffuser plate ensuring that the top of the aperture cone is inserted into the bottom of the reading area insert. Lower the diffuser plate until it is properly seated and secured by the front panel latches.

CAUTION

Do not attempt to force the diffuser plate into a latched condition or damage to the equipment will result.

2.2 FUSE REPLACEMENT PROCEDURES

CAUTION

Make certain that a-c input power has been disconnected from the instrument before attempting fuse replacement procedures.

There is one fuse (located on the rear chassis panel) employed in the TD-502/TD-502LB: no special instructions are required for replacement. Replacement fuses must comply with the information contained in Table 2-1 below.

TABLE 2-1. FUSE REPLACEMENT DATA

FUSE	RATING	DESCRIPTION
F1		
STANDARD BASE:		
115 vac operation	1 amp, 250V	3AG, ¼ in (6mm) x 1¼ in (32mm), cartridge type, Slo-Blo (Macbeth Part #31010001)
230 vac operation	½ amp, 250V	Same description as above except Macbeth Part #31005001.
LARGE BASE:		
115 vac operation	3 amp, 250V	Same description as above except Macbeth Part #31030001.
230 vac operation	1½amp, 250V	Same description as above except Macbeth Part #31015000.

CAUTION

Do not replace a fuse with one of higher rating. If a fuse burns out immediately after replacement, do not replace it a second time until the cause of the trouble has been located and corrected.

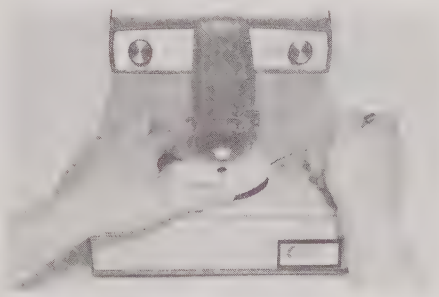
2.3 LIGHT SOURCE REPLACEMENT

A spare lamp is provided as an accessory item with the instrument and is contained in the stage base. If additional lamps (Macbeth Part #30950000) are required, they can be obtained from the spare parts order desk of the Macbeth Division of Kollmorgen Corporation, Drawer 950, Newburgh, New York 12550.

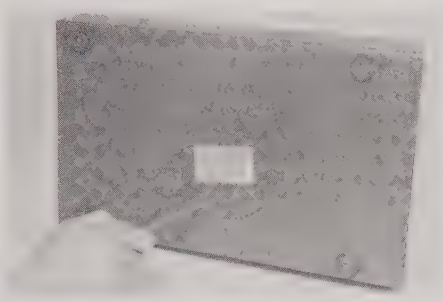
2.3.1 STANDARD BASE INSTRUMENT (TD-502)

a. Ensure that a-c input power has been disconnected from the instrument.

b. Using a small screwdriver, remove the circular stage diffuser disc from the stage base.



c. Carefully set the instrument on its side. Loosen and remove three screws securing the circular access plate to the base of the instrument.



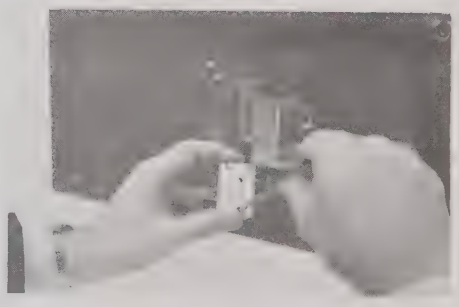
d. Using a thin-shafted standard or an offset screwdriver, loosen (do not remove) the two screws securing the lamp socket assembly to the lamp holder bracket.

CAUTION

In the event that a standard screwdriver is used to loosen the screws in d above, caution and care should be exercised to prevent burring or rounding-off the slots of the screws.

e. Carefully slip the lamp socket assembly free of the lamp holder bracket. Lift the lamp socket assembly out of the instrument base.

f. Loosen (do not remove) two screws securing the socket stiffener plates to the lamp socket. Remove the lamp from the socket.



IMPORTANT

Spare lamps (Macbeth Part #30950000) are provided with a protective cover. This cover should be left in place until the lamp is completely installed. Lamps touched with bare fingers must be cleaned with isopropyl alcohol before a-c power is applied to the instrument.

g. Install the lamp in the socket; ensure that the lamp prongs are fully seated in the socket; tighten the screws securing the socket stiffener plates to the lamp socket.

h. Remount the lamp socket assembly to the lamp holder bracket; do not tighten the screws.

NOTE

Steps i through k constitute the electronic centering adjustment for the optical light source.

CAUTION

The electrical leads for the light source carry 9 volt a-c. Caution should be exercised when working near an energized light source. DO NOT SHORT CIRCUIT THE LAMP LEADS.

i. Depress the Snout Lever and hold it down. Momentarily adjust the ZERO control for a digital display of "0.00."

j. Slowly move the lamp socket assembly from side to side while observing the digital display. The display should indicate readings above and below 0.00 dependent upon the lamp socket position.

NOTE

Digital display indications below 0.00 will appear as 9.99, 9.98, 9.97, etc.

k. Position the lamp socket assembly to the location resulting in the maximum below 0.00 indication and tighten the screws to secure the assembly to the lamp holder bracket. Release the Snout Lever.

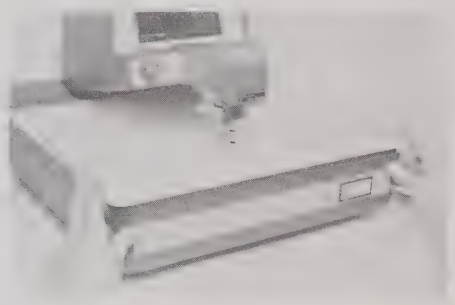
NOTE

The maximum below 0.00 digital display is an indication that the maximum amount of light flux is passing through the insert aperture to the light detector.

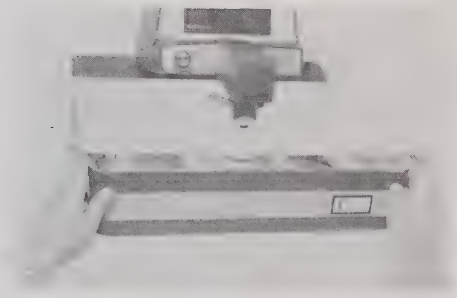
l. Reassemble the instrument in reverse order of disassembly.

2.3.2 LARGE BASE INSTRUMENT (TD-502LB)

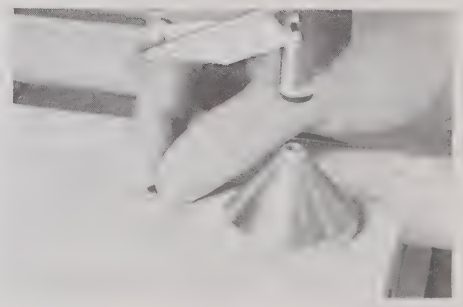
a. Make certain that the a-c input power has been disconnected from the instrument prior to attempting lamp replacement procedures.



b. Remove the diffuser plate from the instrument by depressing the latch release buttons located on the left and right edges of the front panel. Lift the plate upwards to clear the reading area insert from its engagement with the aperture cone; draw the plate towards the operator.



c. Remove the illumination assembly cover by unscrewing the captive screw; lifting the cover upwards and forward out of the slot.

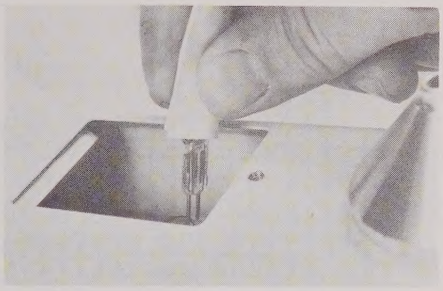


d. Firmly grasp the lamp and lift straight upwards to remove from the socket.

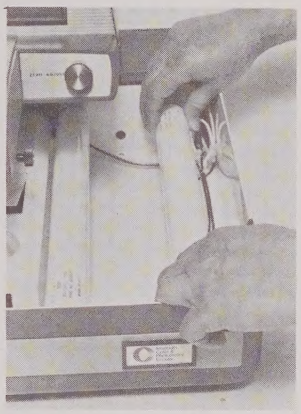
NOTE

Spare lamps (Macbeth Part #30950000) are provided with a protective cover. This cover should be left in place until the lamp is completely installed. Lamps should not be touched with bare fingers. Lamps touched with bare fingers must be cleaned with isopropyl alcohol before a-c power is applied.

e. Install the replacement lamp in the socket by holding the lamp with the plastic cover in place. Ensure that the lamp pins buttom out in the socket for the proper connection. Remove the protective cover from the lamp.



f. The fluorescent lamps may be changed by firmly grasping the lamp and rotating it in its socket until the pins appear in the socket slots. Remove the lamp by carefully lifting it out of the socket.



CAUTION

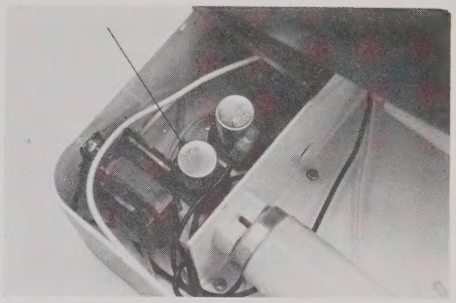
Care must be exercised in the handling of the fluorescent lamps to prevent breakage which may result in personal injury.

g. Install replacement lamp by inserting pins into the socket slots and rotating the lamp to a locked position.

NOTE

The instrument contains four starters and four ballasts; two of each are located on opposite sides of the instrument.

h. To replace fluorescent lamp starters: remove two screws securing the left and right top rear panels; turn starter counter-clockwise one quarter turn and lift out of the socket.



i. Replace the starter by inserting it into the socket and turning it clockwise one quarter turn.

j. Reassemble the instrument in the reverse order of disassembly.

APPENDIX A.

AUXILIARY PRINT OUT (TD-502/TD-502LB)

The TD-502 series of instruments contain facilities to enable the transmission of density readings and filter identification (via BCD output signals) to auxiliary print-out equipment. As a customer option, a BCD kit (Macbeth Part #59000240) is available for installation, however, kit construction and installation may be accomplished at the factory, by an authorized Macbeth service organization, or by the customer.

NOTE

Input signal connections for the auxiliary print-out device are unique to the specific equipment used. Information regarding these units must be obtained from the appropriate manufacturer.

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